MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 1, 2019/2020

EME1016 – APPLIED STATICS

(ME)

17 OCTOBER 2019
9:00 a.m – 11:00 a.m
(2 Hours)

INSTRUCTIONS TO STUDENTS

1. This Question paper consists of 6 pages with 4 Questions only.
2. Attempt **ALL** questions. All questions carry equal marks and the distribution of the marks for each question is given.
3. Please write all your answers in the Answer Booklet provided.

Question 1:

(a) Four couples are acting on the pipe column. Given $F_1 = 150$ N, $F_2 = 170$ N and $F_3 = 90$ N.

(i) Find the Cartesian vector form for each of the couple moment. **[10 marks]**

(ii) Determine the magnitude of the resultant couple moment. **[2 marks]**

(iii) Determine the coordinate direction angles of the resultant couple moment. **[3 marks]**

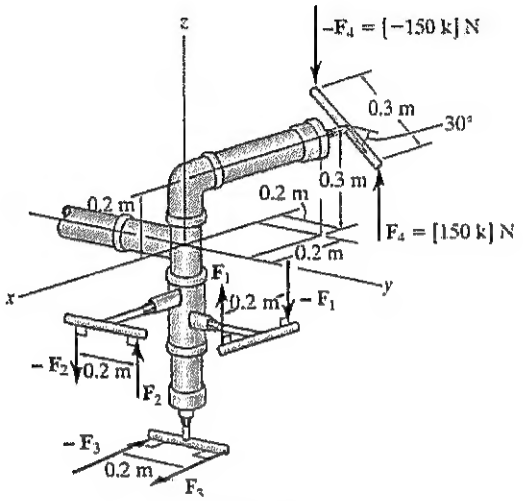

Figure 1

(b) **Figure 2** shows a frame that being supported by 2 supports at Point A and Point B.

(i) Draw the FBD of the frame. **[4 marks]**

(ii) Determine the force acting at support **A** and **B**. **[6 marks]**

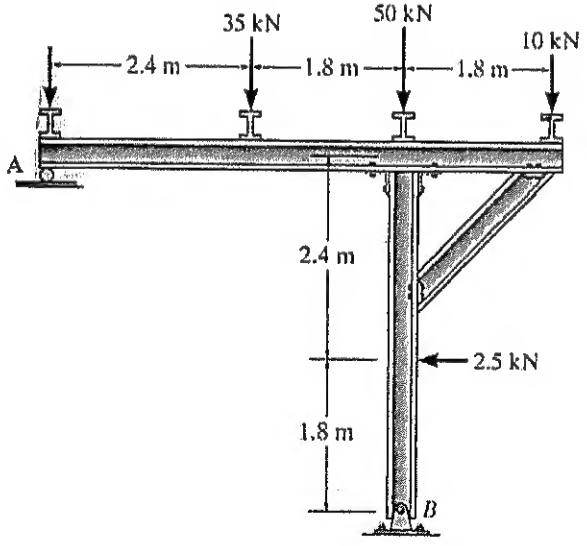

Figure 2

Continued.....

Question 2:

Figure 3 shows a truss which is supported by four external loads. The truss is supported by a hinge at A and roller at E. Given $P_1 = 20$ kN and $P_2 = 16$ kN.

(a) Draw the FBD of the truss. **[4 marks]**
(b) Determine if zero force memb r exists in the truss. Specify? **[2 marks]**
(c) Find the reaction of the support at A and G. **[10 marks]**
(d) Find the internal force within the members EB, CD and CB. State whether it is compressive or tensile. **[9 marks]**

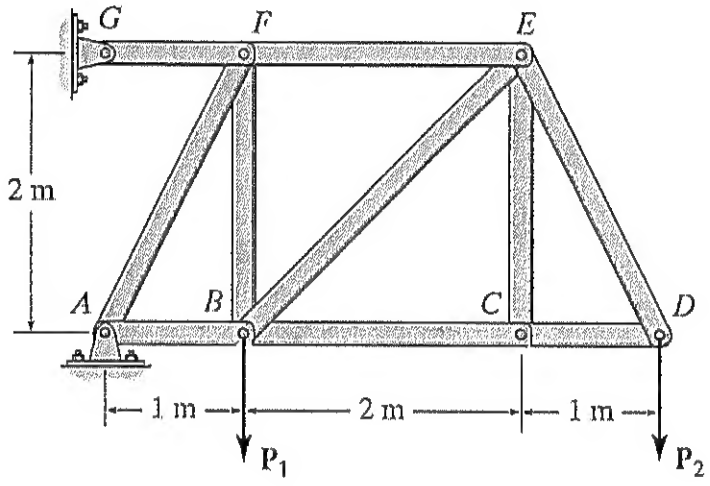

Figure 3

Continued.....

Question 3:

(a) Draw the free body diagram and determine the reactions at pin *A* and roller *B* on the beam as shown in **Figure 4**. **[8 marks]**

(b) Draw the shear force and bending moment diagrams for the supported beam as shown in **Figure 4**. **[17 marks]**

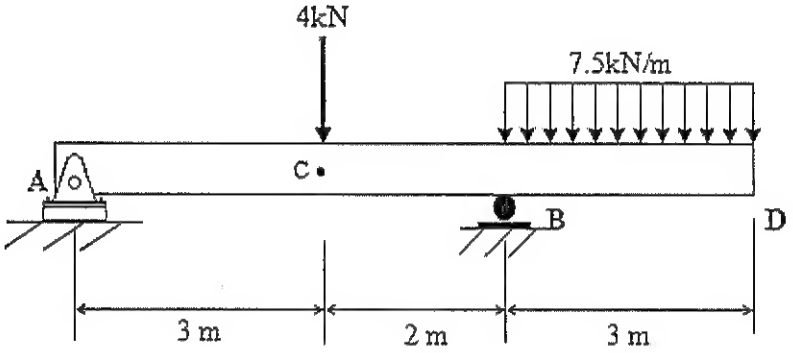

Figure 4

Continued.....

Question 4:

(a) For the beam's cross sectional areas as shown in **Figure 5**.

(i) Determine the location $\bar{x}$ of the centroid, C of the beam's cross-sectional areas. **[5 marks]**

(ii) Determine the moment of inertia for the beam's cross-sectional area about the y' axis. **[5 marks]**

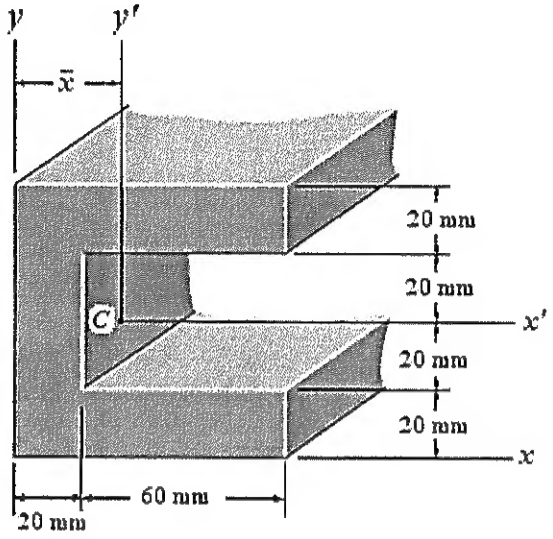

Figure 5

(b) The weight of 16 N block A is attached to link AC and rests on the weight of 24 N block B as shown in **Figure 6**. Knowing that the coefficient of static friction (μ_s) is 0.20 between all surfaces of contact and neglecting the mass of the link AC.

(i) Draw the free body diagram (FBD) of the block A and block B. **[5 marks]**

(ii) Determine the value of θ in degree for which motion of block B is impending.
[10 marks]

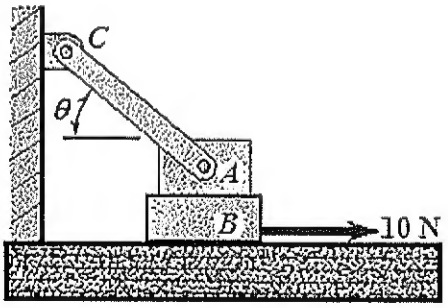

Figure 6

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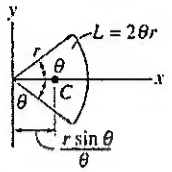
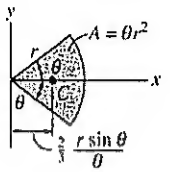
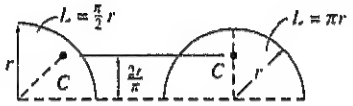
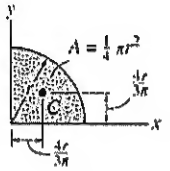
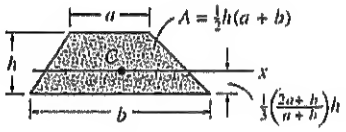
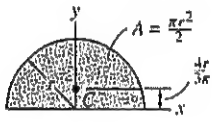
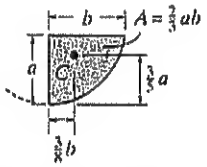
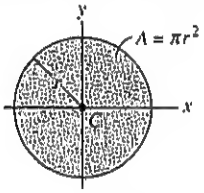
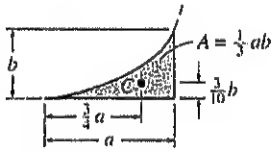
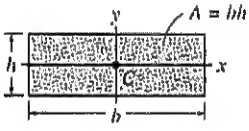
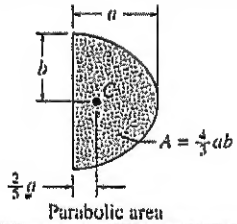
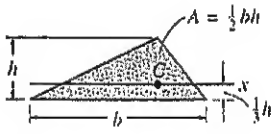
Appendix: Geometric properties of line and area elements

Centroid Location	Centroid Location	Area Moment of Inertia
 Circular arc segment	 Circular sector area	$I_x = \frac{1}{4}r^4(\theta - \frac{1}{2}\sin 2\theta$ $I_x = \frac{1}{4}r^4(\theta + \frac{1}{2}\sin 2\theta$
 Quarter and semicircle arcs	 Quarter circle area	$I_x = \frac{1}{16}\pi r^4$ $I_y = \frac{1}{16}\pi r^4$
 Trapezoidal area	 Semicircular area	$I_x = \frac{1}{8}\pi r^4$ $I_y = \frac{1}{8}\pi r^4$
 Semiparabolic area	 Circular area	$I_x = \frac{1}{2}\pi r^4$ $I_y = \frac{1}{4}\pi r^4$
 Exparabolic area	 Rectangular area	$I_x = \frac{1}{12}bh^3$ $I_y = \frac{1}{12}hb^3$
 Parabolic area	 Triangular area	$I_x = \frac{1}{36}bh^3$

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